Trend Study 25A-18-04

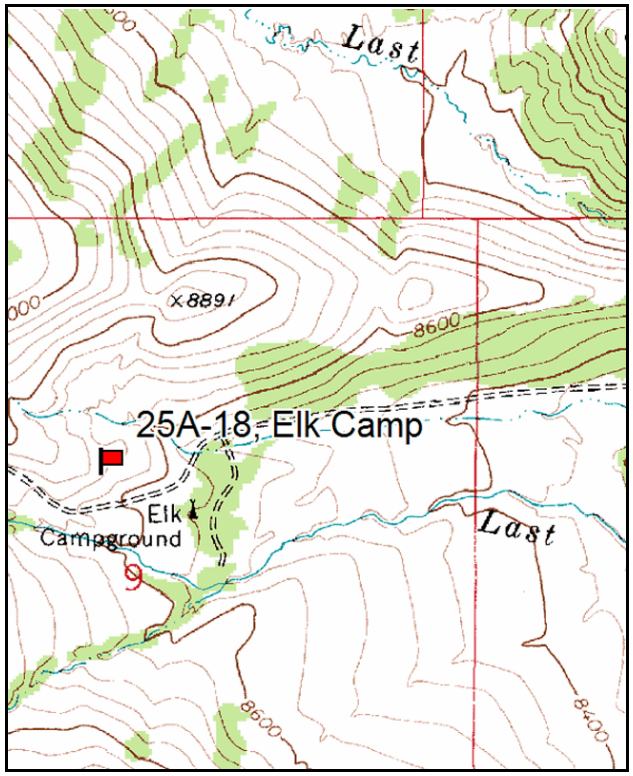
Study site name: Elk Camp . Vegetation type: Mixed Mountain Brush .

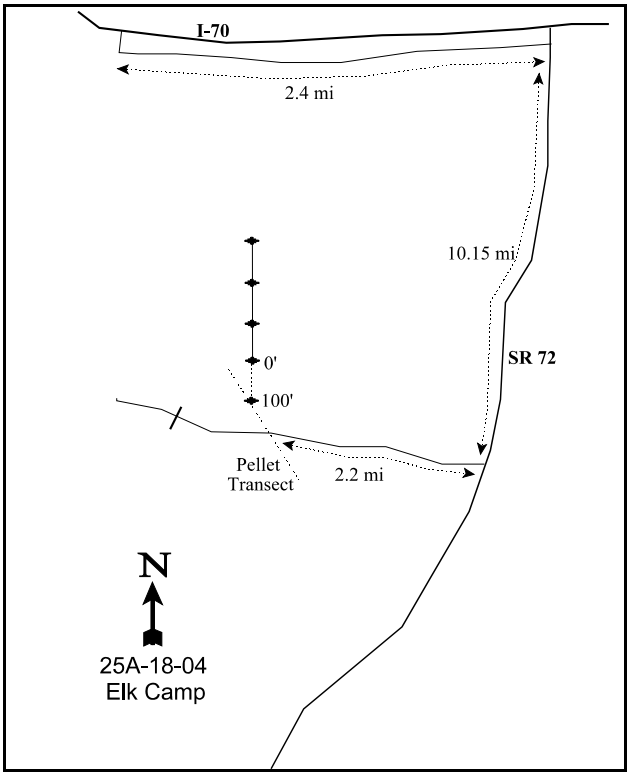
Compass bearing: frequency baseline Line 1- 170 degrees magnetic, Lines 2-4- 352 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Go east from Salina on I-70 for approximately 37.5 miles to the rest area. From the exit, go 2.4 miles east on the frontage road to the junction with SR72. Travel south on SR 72 for 10.15 miles to a gravel road to the right with a sign for Last Chance Road. Turn and go 2 miles to the Elk Camp Road, and continue straight for another 0.2 miles. Stop here, approximately 90 yards short of a cattleguard, and look for a small yellow stake 10 feet off the south side of the road. The yellow pellet group transect stakes run northwest, with one stake every 30 feet. Follow the yellow stakes 90 feet up from the road to a large rebar which marks the 100-foot end of the frequency baseline. The 0-foot baseline stake is 100 feet north and is tagged #7040.





Map Name: John's Peak, Utah

Diagrammatic Sketch

Township 25S , Range 4E , Section 9

GPS: NAD 27, UTM 12S 4278135 N, 458328 E

DISCUSSION

Elk Camp - Trend Study No. 25A-18

The Elk Camp trend study is located alongside a DWR pellet group transect on the south side of a hill overlooking Elk Campground and South Last Chance Creek. The hill has a slope of about 30-35% near the base, but it levels out to 10-15% further up the baseline. Elevation is approximately 8,680 feet. The surrounding gentle hills are covered by open sagebrush, grass slopes, scattered pinyon and juniper, and patches of aspen. The vegetation type of the trend study is a mixed mountain brush, dominated by black sagebrush and antelope bitterbrush.

Pellet group counts demonstrate that deer use varies greatly from year to year (Jense et al. 1985, 1991). The site is above the normal limits of deer winter range as described by Huff and Blotter (1964), but is good range for mild winters and as a transitional range during the spring and fall. Elk use is low but it has increased steadily since 1980 (Jense et al. 1985, 1991). In the past, the area was grazed by sheep, but in 1978 the permits were converted to cattle and it became a part of the Last Chance Cattle Allotment (Fish Lake National Forest). However, sheep were noted on a hillside nearby the transect in July of 1985. The area is within the Lower Last Chance pasture of the Last Chance allotment. Grazing occurs for 25 days on odd years, then the area is rested on even years. Grazing use is light on the slope, but heavier in the valley below along the riparian corridor. Pellet group data taken along the study site baseline in 1999 estimated 53 deer, 21 elk and 11 cow days use/acre (130 ddu/ha, 52 edu/ha, 27 cdu/ha). All of the cattle pats were from the previous season. Most of the deer and elk pellet groups were from winter use, but some were more recent. A fawn that had recently died was found near the site in 1999. Pellet group data in 2004 estimated 65 deer and 4 cow days use/acre (162 ddu/ha and 9 cdu/ha). Cattle pats were from the previous year.

Soil on the site is moderately shallow due to the rocky nature of the site. Effective rooting depth was estimated at only 11 inches. Soil texture is a loam with a slightly acid pH (6.5). There are many large rocks on the surface and throughout the soil. These rocks are of volcanic origin, as is the soil. Infiltration of water is good, but minor sheet erosion has removed some of the top soil leaving an erosion pavement. Pedestaling and terracing is evident on the steeper slopes but erosion is minimal and was rated as stable in 2004 due to the high protective ground cover.

There are several species of shrubs present on the site. The key browse species are black sagebrush, mountain big sagebrush, and bitterbrush. Black sagebrush appeared to be declining in 1985 and 1991. Over 50% of the population was decadent in 1985 and many plants had poor vigor. In 1991, percent decadency increased to 70%. The plants had been lightly to moderately utilized. In 1999, the study baseline was lengthened from 100 feet to 400 feet in order to get a better sample. This much larger sample is more effective at estimating shrub densities which often have aggregated and/or discontinuous distributions. Density of black sagebrush with the new sample was 3,560 plants/acre in 1999. Utilization was light to moderate but vigor has improved and decadency has declined from 70% to 21%. The change in density is due primarily to the much larger sample since there were only 160 dead plants sampled. In 2004, black sagebrush density declined 16% to 2,980 plants/acre. Decadence increased to 28%, while the percent of the population that was classified as dying increased from 2% to 11%. Utilization was still light to moderate.

The mountain big sagebrush occurs in larger numbers further up the slope where it levels out and the soil is deeper. Cover for mountain big sagebrush increased from about 8% in 1999 to 10% in 2004. Density remained stable with 2,600 plants/acre in 2004. In 2004, the number of seedlings sampled was very high, while the percentage of young plants has always been good. Use of the mountain big sagebrush has been moderate and vigor has been good since 1985. Dead plants were common in 1999 due in part to a spotty prescribed burn which effected one of the frequency/density belts. Many of the dead sagebrush were actually burned stems.

The most preferred browse on the site is bitterbrush which has a low spreading growth form on this site. Bitterbrush has been classified as heavily utilized each time this site has been sampled. This population has steadily declined in density since 1985. In 1985 density was 5,599 plants/acre and declined to 3,866 plants/acre in 1991. In 1999, the baseline was lengthened to get a more representative sample and density was 2,560 by 1999. It is difficult to say if the density had declined in 1999 or if the new sample size was the cause for the lower density. However in 2004, density decreased 20% to 2,060 plants/acre. During the 1999 and 2004 readings, many bitterbrush plants had been browsed to the point where they have become partly unavailable and some mature plants were classified as unavailable due to heavy use. None of the bitterbrush were producing seed on the site in 1999, but some seedlings and young were encountered. Decadence was extremely high in 1991 at 90%, although it was only 5% and 9% in 1999 and 2004 respectively.

There is a variety of other browse on the site such as snowberry, gray horsebrush, rubber rabbitbrush, and stickyleaf low rabbitbrush. Broom snakeweed density increased by 64% from 580 plants/acre in 1999 to 1,620 plants/acre in 2004.

The site supports a variety of grasses and forbs. The most abundant grasses include mutton bluegrass, sedge, and blue grama. Mutton bluegrass declined significantly in 2004 in nested frequency, but cover remained stable. Blue grama is abundant on the south facing slopes, while the sedge is abundant on the north facing slopes. Forbs are diverse but not very abundant. The more frequently encountered species are low growing and offer little forage.

1985 APPARENT TREND ASSESSMENT

The range appears healthy and well-balanced. The vegetative trend is considered stable. The age class composition information alone would indicate a declining population for black sagebrush. However, over the area as a whole, it appears well-established with adequate regeneration. The bitterbrush population is quite healthy, although heavily hedged. The plant composition is unlikely to change over the next five years, as the diversity should help protect it from any sudden changes. The soil trend is also stable, although it sustains a small amount of top soil loss because of the slope and rockiness of the site.

1991 TREND ASSESSMENT

The soil trend is down because of the increase in percent bare ground which has increased from 9 to 21% and the loss of litter from 61% down to 44%. These data would indicate the propensity for accelerated soil loss to high intensity summer storms. Overall, there are three key browse species, black sagebrush, mountain big sagebrush, and bitterbrush. Black sagebrush decreased in density by 6% (8,532 down to 7,999) and decadency went from 56% to 70%. Mountain big sagebrush density increased by 52% and was the only species to increase. Bitterbrush density decreased by 31%. Percent decadency for bitterbrush increased from 1% to 90%. The trend for browse would be slightly down. For the herbaceous understory, the grasses as a group slightly increased, while the forbs were stable. The forbs that did increase were small and insignificant as a forage for wildlife.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly down (2)
herbaceous understory - stable (3)

1999 TREND ASSESSMENT

Trend for soil is stable to slightly improving. Percent cover of bare ground has declined from 21% to 14% and litter cover declined from 44% to 34%. Erosion is minimal. Trend for browse is stable. Density of black

sagebrush declined 55% since 1991 but most of the change is due to the larger sample taken in 1999. Use remains moderate to heavy but vigor has improved and percent decadence has declined from 70% to 21%. Mountain big sagebrush has increased in density. It too shows moderate use but displays good vigor and low decadence. Bitterbrush, the most preferred species, continues to be heavily browsed. Vigor has improved and percent decadence has declined from 90% in 1991 to only 5% now. The population currently appears stable but no plants were producing seed in 1999 due to the heavy use and drought. Trend for the herbaceous understory is stable with similar sum of nested frequency values for perennial grasses and forbs compared to 1991.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

2004 TREND ASSESSMENT

The trend for soil is stable. The ratio of protective cover (vegetation, litter, and cryptogams) to bare ground remained stable at 1:3.1, which is good. Erosion is rated as stable. The browse trend is slightly down. The key species are bitterbrush, mountain big sagebrush, and black sagebrush. Density for each of these three species declined slightly. Decadence was slightly higher for all three, but percent decadence is not very high for any of them. Utilization is very heavy for bitterbrush, which is the most preferred species and can tolerate heavy use. Young plants make up only 5% of the population for bitterbrush. Cover was stable for black sagebrush, slightly up for mountain big sagebrush, and slightly down for bitterbrush. Broom snakeweed, an increaser species, has substantially higher density and cover. The herbaceous understory trend is still considered stable with some slight decreases in perennial nested frequency for both grasses and forbs. However, this is not enough change to warrant a change in trend. It appears that at this higher elevation drought conditions have not been as detrimental to the herbaceous understory as has been the case for sites at lower elevations. Sum of nested frequency was down 6% for grasses and 14% for perennial forbs. Perennial grasses contribute to over 80% of the herbaceous production. Mutton bluegrass is the only species to be significantly less abundant than it was in 1999.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 25A, Study no: 18

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Agropyron smithii	$_{a}$-	$_{b}$13	$_{bc}$18	$_{c}$32	.11	.25
G	Bouteloua gracilis	73	76	96	67	3.65	2.12
G	Carex spp.	$_{ab}$112	$_{a}$88	$_{ab}$106	$_{b}$147	3.25	2.18
G	Festuca ovina	2	4	9	3	.09	.15
G	Poa fendleriana	$_{b}$192	$_{b}$186	$_{b}$194	$_{a}$138	3.56	3.93
G	Sitanion hystrix	$_{b}$83	$_{b}$109	$_{a}$47	$_{a}$32	.42	.59

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
G	Stipa comata	-	-	-	5	-	.07
G	Stipa lettermani	$_{a}$20	$_{ab}$46	$_{ab}$46	$_{b}$61	.90	1.95
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		482	522	516	485	12.00	11.26
Total for Grasses		482	522	516	485	12.00	11.26
F	Agoseris glauca	$_{a}$-	$_{b}$14	$_{a}$-	$_{a}$-	-	-
F	Allium spp.	-	2	7	11	.03	.02
F	Antennaria rosea	$_{bc}$23	$_{a}$9	$_{c}$36	$_{ab}$18	.83	.78
F	Androsace septentrionalis (a)	-	-	5	-	.01	-
F	Arabis demissa	$_{b}$12	$_{a}$8	$_{a}$7	$_{a}$-	.18	-
F	Artemisia ludoviciana	2	3	-	-	-	-
F	Astragalus spp.	$_{a}$-	$_{a}$-	$_{b}$22	$_{a}$9	.14	.05
F	Castilleja chromosa	$_{b}$13	$_{b}$13	$_{a}$-	$_{a}$-	-	-
F	Chaenactis douglasii	2	-	-	3	-	.00
F	Chenopodium spp. (a)	-	-	-	8	-	.05
F	Cirsium spp.	-	-	4	7	.18	.09
F	Comandra pallida	-	-	5	7	.06	.04
F	Collinsia parviflora (a)	-	-	9	-	.02	-
F	Cryptantha spp.	-	2	-	-	-	-
F	Erigeron eatonii	-	-	-	5	-	.03
F	Erigeron pumilus	-	-	6	8	.18	.04
F	Eriogonum racemosum	25	34	24	31	.27	.52
F	Eriogonum umbellatum	$_{b}$16	$_{ab}$11	$_{ab}$4	$_{a}$-	.01	-
F	Gayophytum ramosissimum(a)	-	-	-	5	-	.03
F	Hymenoxys richardsonii	$_{b}$18	$_{a}$7	$_{a}$-	$_{a}$-	-	.00
F	Lappula occidentalis (a)	-	-	-	4	-	.01
F	Lithospermum incisum	-	3	-	1	-	.03
F	Lupinus argenteus	-	-	-	2	-	.03
F	Machaeranthera canescens	$_{ab}$11	$_{a}$3	$_{ab}$12	$_{b}$15	.05	.17
F	Machaeranthera grindelioides	-	-	-	2	-	.03
F	Penstemon spp.	$_{a}$-	$_{ab}$2	$_{b}$10	$_{ab}$5	.05	.01
F	Phlox austromontana	$_{a}$-	$_{a}$-	$_{b}$32	$_{b}$24	.35	.48
F	Phlox longifolia	$_{b}$19	$_{c}$48	$_{a}$4	$_{a}$6	.01	.01
F	Polygonum douglasii (a)	-	-	$_{a}$1	$_{b}$18	.00	.05
F	Senecio multilobatus	2	-	7	-	.04	-
F	Sphaeralcea coccinea	6	3	3	-	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'99	'04	'99	'04
F	Unknown forb-perennial	$_{b}$14	$_{a}$-	$_{a}$-	$_{ab}$3	-	.03
F	Zigadenus paniculatus	3	-	-	-	-	-
Total for Annual Forbs		0	0	15	35	0.03	0.15
Total for Perennial Forbs		166	162	183	157	2.42	2.39
Total for Forbs		166	162	198	192	2.46	2.55

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 25A, Study no: 18

Type	Species	Strip Frequency		Average Cover %	
		'99	'04	'99	'04
B	Artemisia frigida	4	5	-	.06
B	Artemisia nova	52	51	5.33	5.49
B	Artemisia tridentata vaseyana	58	61	7.46	9.98
B	Chrysothamnus nauseosus hololeucus	7	13	.48	.51
B	Chrysothamnus viscidiflorus viscidiflorus	69	69	3.28	7.94
B	Coryphantha vivipara	2	2	.00	-
B	Eriogonum microthecum	0	0	-	-
B	Gutierrezia sarothrae	12	28	.70	1.05
B	Mahonia repens	7	9	.04	.15
B	Opuntia spp.	0	3	-	-
B	Pediocactus simpsonii	0	5	-	.00
B	Pinus edulis	3	4	2.51	1.69
B	Purshia tridentata	49	46	6.53	5.57
B	Rosa woodsii	17	12	1.89	.69
B	Symphoricarpos oreophilus	23	27	.75	.88
B	Tetradymia canescens	11	15	.06	.09
Total for Browse		314	350	29.08	34.14

CANOPY COVER, LINE INTERCEPT --
Management unit 25A, Study no: 18

Species	Percent Cover	
	'99	'04
Artemisia frigida	-	.11
Artemisia nova	-	5.73
Artemisia tridentata vaseyana	-	9.53
Chrysothamnus nauseosus hololeucus	-	.68
Chrysothamnus viscidiflorus viscidiflorus	-	7.61
Gutierrezia sarothrae	-	.95
Mahonia repens	-	.13
Pinus edulis	4.19	4.30
Purshia tridentata	-	8.36
Rosa woodsii	-	1.26
Symphoricarpos oreophilus	-	2.38
Tetradymia canescens	-	.75

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25A, Study no: 18

Species	Average leader growth (in)
	'04
Artemisia tridentata vaseyana	2.9
Purshia tridentata	6.2

POINT-QUARTER TREE DATA --
Management unit 25A, Study no: 18

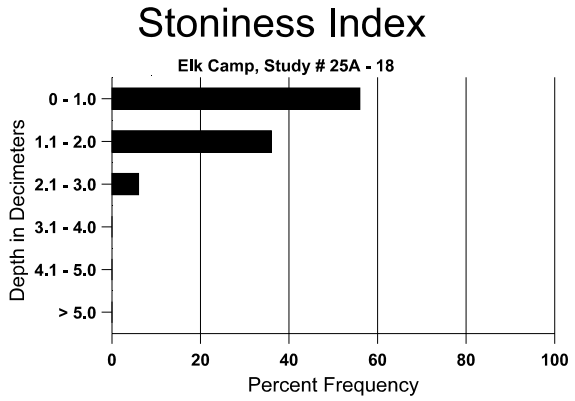
Species	Trees per Acre		Average diameter (in)	
	'99	'04	'99	'04
Juniperus scopulorum	10	24	3.8	3.8
Pinus edulis	10	26	3.8	6.4

BASIC COVER --
Management unit 25A, Study no: 18

Cover Type	Average Cover %			
	'85	'91	'99	'04
Vegetation	5.50	13.00	42.04	45.70
Rock	17.25	21.50	15.66	16.39
Pavement	7.00	.75	2.48	3.81
Litter	60.75	44.25	33.96	31.74
Cryptogams	.25	0	.06	.04
Bare Ground	9.25	20.50	14.08	19.52

SOIL ANALYSIS DATA --
Management unit 25A, Study no: 18, Study Name: Elk Camp

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.0	46.0 (15.6)	6.5	50.9	29.8	19.3	3.0	16.8	211.2	0.5



PELLET GROUP DATA --
Management unit 25A, Study no: 18

Type	Quadrat Frequency	
	'99	'04
Rabbit	23	27
Elk	18	4
Deer	27	49
Cattle	4	1

Days use per acre (ha)	
'99	'04
-	-
21 (52)	-
53 (130)	66 (162)
11 (27)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 25A, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
85	**666**	-	66	600	-	-	0	0	-	-	0	3/2
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**120**	-	40	80	-	-	33	0	-	-	0	3/8
04	**240**	-	20	220	-	-	50	8	-	-	0	6/7
Artemisia nova												
85	**8532**	200	1066	2666	4800	-	47	3	56	.70	11	10/16
91	**7999**	-	466	1933	5600	-	37	44	70	2	13	11/16
99	**3560**	60	360	2460	740	160	35	7	21	2	2	10/20
04	**2980**	80	140	2020	820	220	25	14	28	11	11	9/19
Artemisia tridentata vaseyana												
85	**933**	66	333	400	200	-	57	0	21	-	7	18/20
91	**1932**	66	666	666	600	-	52	7	31	4	17	22/23
99	**2740**	180	640	1680	420	880	44	3	15	7	7	27/37
04	**2600**	700	480	1660	460	260	40	22	18	9	9	19/31
Chrysothamnus nauseosus hololeucus												
85	**66**	-	-	-	66	-	0	100	100	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
99	**280**	-	20	260	-	20	7	21	0	-	0	9/13
04	**360**	-	-	360	-	-	39	0	0	-	0	12/18
Chrysothamnus viscidiflorus viscidiflorus												
85	**8065**	66	1866	6133	66	-	0	0	1	-	0	5/10
91	**10866**	-	2733	7733	400	-	31	21	4	.18	.61	3/7
99	**4060**	-	500	3460	100	-	5	1	2	.98	.98	6/12
04	**4740**	-	140	4540	60	-	0	0	1	.42	.42	9/15
Coryphantha vivipara												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	3/2
04	**40**	-	-	40	-	-	0	0	-	-	0	2/3
Eriogonum microthecum												
85	**133**	-	-	133	-	-	0	0	-	-	0	1/4
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**580**	-	-	580	-	-	0	0	-	-	0	5/7
04	**1620**	-	-	1620	-	-	0	0	-	-	0	9/10
Juniperus scopulorum												
85	**66**	-	-	66	-	-	0	0	-	-	0	46/41
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**780**	-	140	640	-	-	0	0	-	-	0	2/2
04	**580**	-	-	580	-	-	0	0	-	-	0	3/4
Opuntia spp.												
85	**599**	-	66	533	-	-	0	0	0	-	0	2/1
91	**398**	-	66	266	66	-	0	0	17	-	0	2/5
99	**0**	-	-	-	-	-	0	0	0	-	0	2/5
04	**80**	-	40	40	-	-	0	0	0	-	0	3/8
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**120**	-	80	40	-	-	0	0	-	-	0	3/5
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**60**	-	20	40	-	-	0	0	-	-	0	-/-
04	**80**	-	40	40	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	**5599**	333	2333	3200	66	-	30	46	1	-	0	13/21
91	**3866**	-	-	400	3466	-	2	97	90	12	40	6/16
99	**2560**	20	360	2060	140	20	32	57	5	3	3	13/29
04	**2060**	-	100	1780	180	100	9	90	9	7	7	13/31

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Rosa woodsii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**1480**	60	620	860	-	-	0	0	-	-	0	12/14
04	**1100**	-	40	1060	-	-	0	0	-	-	0	8/8
Symphoricarpos oreophilus												
85	**866**	-	266	600	-	-	38	0	0	-	0	18/16
91	**1265**	-	133	1066	66	-	11	53	5	-	0	19/16
99	**560**	20	100	460	-	-	39	18	0	-	0	18/30
04	**800**	20	100	700	-	-	8	0	0	-	0	16/32
Tetradymia canescens												
85	**399**	-	66	133	200	-	17	0	50	-	0	7/5
91	**465**	-	66	133	266	-	14	43	57	9	29	13/10
99	**260**	-	20	160	80	-	54	0	31	8	8	10/10
04	**320**	-	60	260	-	-	38	6	0	-	0	11/12
Yucca spp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	7/9